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METHOD FOR PRINTING OF A RECORDING

For single- or multi-color printing of a recording medium, for example of a single sheet or of a belt-shaped recording medium made from the most varied materials (for example plastic, paper or thin metal foils), it is known to generate image-dependent potential images (charge images) on a potential image carrier (for example a photoconductor), to ink these potential images in a developer station (inking station) and to transfer-printed the image so developed onto the recording medium.

Either dry toner or liquid developer can thereby be used to develop the potential images.

A method for electrophoretic liquid development (electrophotographic developing) in digital printing systems is, for example, known from EP 0 756 213 B1 or EP 0 727 720 B1. The method described there is also known under the name HVT (high viscosity technology). A carrier fluid comprising silicon oil with ink particles (toner particles) dispersed therein is thereby used as a developer fluid. The toner particles typically have a particle size of less than 1 micron. Something close to this can be learned from EP 0 756 213 B1 or EP 0 727 720 B1, which are components of the disclosure of the present application. Described there are electrophoretic liquid developing methods of the cited type with silicon oil with toner particles dispersed therein as a carrier fluid and additionally a developer station made up of one or more application rollers for wetting the potential image carrier with liquid developer corresponding to the potential images on the potential image carrier. The developed potential image is then transferred onto the recording medium via one or more transfer rollers.

In order to secure the toner images in the recording medium, these are fixed there. Previous liquid developer methods are based on a high-ohmic carrier fluid and solid particles (toner particles) suspended therein with a preferential charge.

- Given use of a volatile carrier fluid the fixing occurs via evaporation of the carrier fluid and simultaneous fusing of the toner particles under heat effect. The resin of the toner particles adheres with one another [sic] and with the recording medium.
- Given use of a non-volatile carrier fluid, for example silicon oil, the fixing occurs via reduction of the carrier fluid on the surface of the recording medium and via the simultaneous fusing of the toner particles under heat effect. The reduction of the carrier fluid thereby occurs via, among other things, suction in the recording medium and/or via conditioner rollers that run on the unfixed print image and thereby absorb carrier fluid.

A liquid developer with a hardenable carrier fluid is known from EP 0 455 343 A1. the bonding of the images to be pritted [sic] with a recording medium occurs via curing of the carrier fluid, whereby a chemical reaction is implemented for curing. The carrier fluid can comprise dimethyl-siloxane bonds. The carrier fluid can additionally comprise a cross-linking agent whose proportion in the carrier fluid can be up to 100%. The curing of the carrier fluid can be initiated by a starter agent.

The problem to be solved by the invention is to specify a method with which the fixing with liquid developer becomes largely independent of the properties of the recording medium and can be specifically controlled corresponding to its properties. Furthermore, the fixing should also be independent of the carrier substance of the color pigment (toner particles).

This problem is solved according to the features of the claim 1.

The invention specifies a novel fixing method for an electrographic printer or copier device. The device comprises an image-generating system that generates an electronic potential image (charge image) on a first potential image carrier (for example a photoconductor), which potential image is made visible via charged ink

substance particles (toner particles) by means of a developer station (inking station) and is subsequently transferred (possibly via further intermediate image carriers such as, for example, transfer rollers, transfer belt) onto a recording medium (for example paper) and fixed on this.

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Claims

1. Method for printing of a recording medium,
- in which potential images of the images to be printed are generated on a potential image carrier (101),
- in which the potential images (101) are developed into an image film (made up of image regions and non-image regions) on the potential image carrier (10) via application of a liquid developer made up of a polymerizable carrier fluid with dye particles suspended therein,
- in which the image film is transferred onto the recording medium (101),
- in which the image film is fixed on the recording medium (101) via cross-linking of the carrier fluid such that the dye particles of the image regions are embedded in a fixed polymer matrix and the carrier fluid hardens into a transparent film that permanently bonds with the recording medium (402) [sic].
- in which the cross-linking reaction of the carrier fluid is started, accelerated or extended (and therewith slowed) by at least one component.

2. Method according to claim 1,
in which increased humidity is used as a component.

3. Method according to claim 2,
in which the increased humidity is generated via vaporization or a spray strip.

4. Method according to claim 2 or 3,
in which the increased humidity is used in connection with a condensation-cross-linked carrier fluid.

5. Method according to claim 1,
in which radiation or, respectively, radiation energy acts on the carrier fluid as a component.

6. Method according to claim 5,
in which the radiation energy is supplied in the form of heat.

7. Method according to claim 5,
in which the radiation energy acts via corona irradiation.

8. Method according to claim 1,
in which a gas (for example ozone) acts on the carrier fluid as a component.

9. Method according to claim 1,
in which a solid material or a fluid that acts as a reaction partner is used as a component.

10. Method according to claim 9,
in which a catalyst that comprises a bond with, for example, platinum, tin, titanium is additionally integrated.

11. Method according to any of the claims 2 through 10,
in which the individual components are combined with one another.

12. Method according to any of the claims 1 through 11,
in which the components act on the carrier fluid at different points in the printing process.

13. Method according to claim 12,
in which the addition of the radiation or, respectively, the action of the increased humidity occurs after the development of the toner image, preferably after the transfer printing onto the recording medium (402).

14. Method according to claim 12,

in which the admixture of a reaction partner into liquid developer occurs via a spray strip or roller application unit in the developer station or, respectively, after the transfer printing onto the recording medium.

15. Method according to claim 12,
in which, given a solid material or a fluid as a component, the recording medium is pre-coated with this.

16. Method according to any of the claims 1 through 15,
in which the carrier fluid is hardened into a transparent film in the non-image regions.

17. Method according to any of the claims 1 through 16,
in which the carrier fluid is based on silicon oil.

18. Method according to claim 17,
in which the silicon oil comprises polydimethylsiloxane.

19. Method according to claim 17,
in which the carrier fluid comprises molecules derived from polydimethylsiloxane that exhibit functional groups.

20. Method according to any of the preceding claims,
in which the liquid developer exhibits a weight proportion of dye particles of 10 to 50%.

21. Method according to any of the preceding claims,
in which the developer fluid exhibits a concentration of dispersion stabilizers in the range from 0.5 to 5%.

22. Method according to claim 21,

in which the concentration of dispersion stabilizers is > 1%.

23. Method according to any of the preceding claims,
in which the integration of color pigments into the ink particles in the liquid developer requires a reduced proportion of a bonding agent.

24. Method according to claim 23,
in which the fixing is independent of the binding agent of the color pigment.

25. Method according to any of the preceding claims,
in which the cross-linking of the carrier fluid occurs via a reaction of radicals with the methyl groups of the polydimethylsiloxane.

26. Method according to claim 25,
in which the cross-linking arises via oxidation with peroxy bonds.

27. Method according to any of the claims 1 through 26,
in which the carrier fluid molecules agglomerate into polymeric macromolecules via a start reaction, chain reaction and/or chain termination reaction.

28. Method according to claim 27,
in which silicon rubber is formed via wide-meshed cross-linking of the organic side groups of the silicon chains as a result of chemical bonds.

29. Method according to claim 28,
in which the agglomeration is acid-catalyzed or, respectively, is initiated via KOH (potassium hydroxide).

30. Method according to claim 27 or 28,
in which the agglomeration occurs in the absence of chain-breaking substances (Me3SiO-) or cross-linking groups (MeSi(-O-)3)

31. Method according to claim 30,
in which the agglomeration is amplified by pyrogenous silicon dioxide.

32. Method according to any of the claims 1 through 240,
in which an oxidative cross-linking (vulcanization) is implemented.

33. Method according to claim 32,
in which the vulcanization occurs via benzyl peroxide and heating.

34. Method according to claim 32,
in which the vulcanization occurs at room temperature via small quantities of Si-H groups that can be catalytically added to previously-added Si-CH=CH2 groups.

35. Method according to claim 32,
in which single-component silicon rubber is cross-linked with acetoxy groups via action of moisture at room temperature.

36. Method according to any of the claims 1 through 24,
in which heat cross-linked (addition cross-linked) silicone comprising 1- or 2-component systems with, for example, platinum as a catalyst are used.

37. Method according to any of the claims 1 through 24,
in which a condensation cross-linked silicon comprising 1- or 2-component systems with, for example, tin as a catalyst and humidity is used for cross-linking.

38. Method according to any of the claims 1 through 24,
in which the cross-linking of the carrier fluid is formed via formation of silicone resins with spatial cross-linking of the siloxane scaffold.

39. Method according to any of the claims 1 through 24,

in which the cross-linking of the carrier fluid occurs via polycondensation.

40. Method according to claim 39,
in which the polycondensation occurs via hydrolysis of phenyl-substituted dichloro- or trichlorosilane in toluene.

41. Method according to any of the claims 1 through 24,
in which the cross-linking of the carrier fluid occurs via polyaddition, whereby respectively two different molecule types are continuously added without separation of byproducts.

42. Method according to any of the preceding claims,
in which [sic] occurs for cross-linking of the carrier fluid under addition of an auxiliary substance and/or of auxiliary energy.

43. Method according to any of the preceding claims,
in which excess carrier fluid is removed by a conditioning roller.

44. Method according to claim 43,
in which a potential is applied to the conditioning roller such that the dye particles are repelled and the carrier fluid is separated.

45. Method acceding to claim 43,
in which the conditioning roller exhibits an absorbent coating.

46. Method according to claim 43 or 44,
in which the conditioning roller is cleaned of the transferred carrier fluid by a scraper or nip bar.

47. Electrographic printer or copier device in which print images transfer-printed onto a recording medium (402) is [sic] fixed according to the method according to any of the preceding claims.

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